

ART. IV.—THE PARALYSES OF POTT'S DISEASE—
BEING A CLINICAL STUDY OF FIFTY-
EIGHT CASES.

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(Read before the N. Y. Neurological Society, December 3, 1877.)

NEARLY a hundred years ago a carious disease of the vertebræ, accompanied occasionally with paraplegia, was so accurately described and so successfully treated by Percival Pott, that the profession, in a pardonable enthusiasm, called the disease after his name, and in *the issue* the cripple placed all his hopes. It was then thought that a specific had been found and that this offspring of scrofula was to be henceforth strangled in its infancy. Yet in all these years the surgeon has had to grapple with the deformity, the physician has had abundant opportunity of studying the paralyzes consecutive thereto, and within the last decade the neurologist has enhanced the value of its study by physiological experiment, aided by the researches of pathology. To the labors of such accurate observers as Leyden and Rosenthal, Charcot and Michaud, are we indebted for those minute investigations into the role played by the cord and its envelopes in the pathogeny of this disease.

Before proceeding farther, let me state that my reason for using the term "paralyzes" in my title rather than the one more commonly employed, *i. e.*, "paraplegias," is because the latter term is included in the former.

The various neuralgias and pseudo-neuralgias, the arthropathies and all those peripheral lesions dependent on irritation of nerves at their roots or in the foramina of exit have been already too well described for me to make aught more than this bare reference in the analysis of the cases I have had the

opportunity of observing. Michaud, in an inaugural dissertation,* details all the symptoms with which one is accustomed to meet, and enters into such careful explanation of the phenomena presenting, that it would seem an act of presumption in me to attempt any contribution at all to the literature of the subject did not our hospital furnish an unusually large number of cases from which to draw information.

Dr. Julius Althaus, in a work recently from the press,† states in the form of proposition with statistical data appended, that "Diseases of the nervous system occupy the fourth rank among maladies destructive of human life." I never see a case of cervical or dorsal caries, but the question instinctively suggests itself: Will the child become paraplegic? Formerly, I feared exceedingly if the gibbosity chanced to be great; now, this forms no guide in the prognosis. Why does disease of the bony column invade the contents of the canal? The ligaments, the perimeningeal tissues and the dura mater, one would think, were sufficient to protect the cord from encroachment, yet we find that these very envelopes play a large part in the propagation of the inflammatory process. In the dead house we often wonder why paralysis has not followed so extensive a carious process and so great an angular deformity.

The locality of the caries in the cervical or upper dorsal regions, is certainly the great predisposing cause of the paralyzes in question. From notes of two hundred and ninety-five cases of Pott's disease I find sixty-two producing paralysis more or less complete. The number wherein the disease was seated above the middle dorsal region was one hundred and eighty-nine, and in this group the sixty-two paralytics are included, only three or four being associated with disease involving the lumbar vertebræ. About one-half, then, of the patients affected with caries in the cervical or upper dorsal regions were at one time paralyzed, while nearly one-fifth of the whole number, irrespective of locality, were thus afflicted.

The vertebræ of the upper portion of the spinal column are small, comparatively, and are closely related to important

* *Sur la Meningite et la Myelite dans le Mal Vertébral.* Paris: 1871.

† *Diseases of the Nervous System.* London: 1877.

nerve centres. Passing over other reasons why the motor columns should be the ones chiefly implicated, I would state the fact as pointed out by Olivier,* that the anterior portion of the cord is held close to the posterior face of the vertebræ by the spinal roots, whilst the posterior portion is five or six lines from the corresponding face of the canal. It is also known that the sensory fibres are near the central deep portions of the cord, while the motor impulses are transmitted by the superficial layers.

Sex offers no predisposition. Of the fifty-eight cases on which my analysis is based, thirty were males and twenty-eight females. I, of course, recognize a nervous diathesis, yet I am unable to state anything positively from a statistical point of view concerning such a diathesis occurring in the patients under observation. That a strumous diathesis may stand in a causative relationship, no one will deny; in fact, this is regarded as lying at the base of many of the so-called neuroses. The exciting causes may be exposure to miasmatic influences, a depraved condition of health and direct injuries, as a blow, a sudden jar, or sudden falling together of two vertebræ through loss of intermediate bodies. When this latter produces the paralysis there is no preceding paresis and hence the ease in diagnosing this as the cause. Pure mechanical compression, of course, acts by arresting the transmission of motor and sensory impulses, and a slow compression may cut off the blood supply. This absence of blood supply is most beautifully shown in a specimen of cord now in the pathological cabinet of the Hospital for the Ruptured and Crippled. The vessels above and below the point of compression could be distinctly seen, while between these points none could be found. The case was presented by me at the Pathological Society, April 21, 1875.† From such, it is easy to see how a reflex paralysis could follow.

Pathology.—A study of the symptoms peculiar to lesions of the different tissues in the neighborhood of the diseased vertebræ, aided by a knowledge of the facts taught by neuro-

* Quoted by H. C. Wood, *Am. Clin. Lectures*, Vol. I., p. 279.

† *Trans. N. Y. Path. Society*, Vol. I., p. 56.

physiology, enables one to state with a great degree of precision the pathology in individual cases. In modern text books we have chapters on peripachymeningitis, on pachymeningitis, on meningitis and the inflammations of all such organic structures. The subject of neuralgia and of pseudo-neuralgia is constantly before the profession in many entertaining forms. The theory of the French school of pathologists is well fortified by the facts collected, and when one is satisfied as to the mode of reproduction of the impaired nerve elements, it (the theory) becomes easy of acceptance.

Let me state as clearly as I can the theory. First there is the caseous osteitis of the bodies of the vertebræ, attacking by contiguity the perimeningeal areolar tissue, the vertebral ligaments of course becoming involved in the morbid process—then the dura mater speedily partakes of the pathological changes—a “pachymeningite externe” being the result—this change characterized by vegetations on its external surface and consecutive caseous alterations, which blend with the caseous detritus in the bone and thickening of the dura just named, from a chronic inflammatory process. The cord becomes compressed, a focus of myelitis is, as a consequence, induced, and from this focus a transverse myelitis followed by a fasciculated sclerosis ascending through the posterior columns and descending through the lateral and anterior.

This caseous external pachymeningitis in Pott's disease as a constant factor, readily explains many of the symptoms peculiar to peripheral neuralgias and paralyzes. Michaud believes that in all cases of angular deformity *myelitis* is the rule, and states that it may exist without giving immediate rise to paraplegia,* claiming to have proven that myelitis is early in its development and may even precede the paralysis.

From a clinical study of the cases now under consideration I think I can approximatively arrive at the different lesions. *Three* seem to have been due to direct pressure from the bony angle itself; *twelve* gave the history and progress of cases of reflex paralysis due to obstruction of the blood supply; the *remaining number* were, I believe, from a myelitis by slow compression.

* Sur la Meningite et la Myelite. Paris, 1871; pp. 17, 20.

The following case so well illustrates the absence of blood-vessels in the part compressed, and likewise the secondary degeneration, that I shall take this opportunity of reporting it for the second time, the more especially to give prominence to the microscopical examination recently made by my friend Dr. Seguin and not published in connection with the first report—I shall purposely pass over the history, referring such of my readers as are interested to the transactions of the New York Pathological Society, Vol. I., p. 56:

CASE I. *Caries of dorsal vertebræ; paraplegia; death from myelitis; cord compressed; ascending and descending degeneration.*

Male, æt. 6, caries eighteen months' standing, marked gibbosity, paraplegia four months. * * * * *

"Lying in the spinal concavity was found a sac, measuring two inches vertically and three and a half laterally. The contents—cheesy, curdy mass. The walls were formed by the anterior common ligaments, thickened connective tissue, and pleura. On making a vertical section of the spinal column from before backward, the body of the eighth dorsal was found entirely gone, the seventh nearly so, and the sixth and ninth partially. Pultaceous matter lay in place of the eighth dorsal and pressed on the spinal cord, which at this point was found anæmic, yellowish and smaller in size. The absence of blood-vessels here was notable. A portion of the gastrocnemius muscle under the microscope showed granular and fatty globules, the muscular striæ were effaced, and occasionally there was a homogeneous mass."

Of the microscopical examination of the cord eighteen months later, after being well preserved in Mueller's fluid, Dr. Seguin thus writes:

"The sections were cut from four points, A—above the seat of pressure; 1. On the upper part of the specimen, *i. e.*, the middle of the cervical enlargement; 2. In the upper dorsal region at a point twenty millimetres above the limit of compression. B. Below the seat of pressure; 3. At a point twenty millimetres below the lower limit of compression, *i. e.*, in the lower dorsal region; 4. In the lower part of the middle of the lumbar enlargement. No sections were cut from the

disorganized and atrophied portion of the cord, because I thought it well not to injure the specimen, and because I doubted if any thing instructive was to be found there.

"The above sections were examined in two ways: 1. In saturated solution of acetate of potassa, without staining. This was to show the granular bodies. 2. By Clarke's method, to show the atrophy of nerve tube in parts, and the sclerosis of the neuralgia. Sections No. 1, treated by acetate of potassa, showed very exquisitely the lesion of ascending degeneration. The columns of Goll, or posterior median columns, were filled with granular bodies. Sections No. 2, seemed quite extensively altered, granular bodies being found in almost all parts of a section—probably from pressure effects causing ischæmia of the parts. Besides the above, granular bodies were found in small number in the external part of the postero-lateral columns—the ascending cerebellar fasciculi of Flechsig.

"Below the seat of pressure, sections 3 and 4 showed the usual descending degenerative changes in the white columns, the mass of granular bodies occupying the outer and posterior part of the antero-lateral columns. The sections prepared by staining with carmine and by Clarke's method afterward, showed the same ascending and descending degeneration as evidenced, not by granular bodies, but by atrophy of nerve fibres and increase of the neuroglia. No lesion existed in the gray matter and the cells of the anterior horns seemed normal. In other words, this examination shows that except at the seat of pressure, there were no lesions other than those of ascending and descending degeneration."

To Dr. Seguin I have also given two specimens of cord taken from patients with marked angular spinal prominence, but who never had any paraplegia. The Doctor made a careful microscopical examination, and was unable to find even a trace of myelitis opposite the point of osseous lesion or in sections made above and below. One of the patients died from post-oesophageal abscess, and was reported at the Pathological Society by my fellow *interne* Dr. J. W. Crenshaw;*

* Transactions, Vol. I., p. 232.

the other died of catarrhal pneumonia, and the notes of the case with post-mortem examination I presented to the same society March 22, 1876.*

As illustrative of the influence a collection of pus may have on a spinal cord when lying in the immediate vicinity, I cite the following case, which was presented to the Pathological Society April 8, 1874, by a former *interne* of the hospital, Dr. Chas. Milne, but which has not as yet been published, it being the paper of a candidate for admission.

CASE II. *Dorsal caries with great deformity; residual abscess in left cervical region opening into a bronchus; paraplegia with recovery; death by suppurative pleuropneumonia; autopsy.*

Male, æt. 6, admitted to the hospital May 17, 1872, affected with caries of the vertebræ, the angular prominence extending from the seventh cervical to the eighth dorsal, two and one-half years' standing; incomplete paraplegia one year, and on admission, boy totally unable to stand alone, though when assisted could take a few steps; no atrophy or flaccidity, but spasm and increase of reflex excitability, with a certain degree of hyperæsthesia; a well marked tumor in left anterior cervical triangular space, feeling like a mass of infiltrated glands and imparting the pulsation of the underlying artery. The exact date of the first appearance of this tumor with reference to the beginning of the paraplegia was not ascertained; at any rate the tumor increased in size after his admission, and in proportion to this increase was the improvement in the paraplegia. The notes read, "some improvement," "abscess enlarging." January 14, 1873, the abscess opened into the left lung, as proven by the symptoms and signs (the minutæ of which I do not record here for lack of space), and the microscopical examination of the sputa. Despite this pulmonary complication his power of locomotion continued to return, and by March 3, 1874, he had recovered perfect use of his lower extremities. The pus, however, was not completely expectorated, and on the date just named he was removed, dying six days later at home. The autopsy was made thirty-six

* *Med. Record*, April 29, 1876, p. 290.

hours after death, and I was assisted by Dr. A. C. Graham, now of Dallas, Texas. We had great difficulty in getting permission to examine even the thorax and spinal column, and even this work the family supervised. The result was, as a consequence, extremely unsatisfactory, yet there was found extensive suppuration of the left lung, a large quantity of pus in the pleural cavity, an old inflammation of the dura and perimeningeal tissue, a narrowing of the spinal cord opposite the remains of the bodies of the seventh and eighth dorsal vertebrae. The specimens were preserved in alcohol, and a microscopical examination was not made.

When we have the extensive cord changes, the destruction of nerve tubes, etc., how is a cure brought about? It must be remembered that the sclerosis involves the neuroglia, and that the secondary degeneration takes the place of the white fasciculi constricting the nerve tubes. Even should the envelope of myeline be destroyed, impulses can be transmitted through the axis cylinder, and should this be destroyed, the degeneration existing in tracts or bundles, other nerve tubes which remain intact may serve for the transmission of impulses. A case at present in the hospital has an incomplete cervical paraplegia with paræsthesia and a complete paraplegia. I can find no pupillary or retinal disturbance of any kind: here I think the paralysis of the superior extremities is peripheral, that of the inferior, central. A patient whose case I have already published,* got a complete paraplegia by slow compression, recovered power within a twelve-month, and while convalescing a true spinal paralysis attacked the right inferior extremity, atrophy soon followed, and by the electrical test the diagnosis was fully confirmed. The pathological process seems to have been about as follows: a transverse myelitis existed above the dorso-lumbar enlargement, this resolved in due time, but the descending sclerosis continued its march, until the enlargement just named had been reached; a focus of myelitis was here induced and the cells of the right anterior horn underwent the usual changes peculiar to this form of paralysis. The child is still under treatment, and the condition of the limb presents few features of encouragement.

**Philadelphia Medical Times*, Dec. 9, 1876.

The symptoms.—In my analysis I find the average duration of the caries before any signs of paralysis were developed to be three years, the shortest period four and one-half months, the longest eleven years. In thirteen the paralysis never became complete, and the duration of this paresis ranged between four weeks and twenty-two months. Twenty-four presented complete paralysis, and in this number are included four which had likewise incomplete cervical paraplegia. In no instance have I met with a cervical paraplegia uncomplicated. All, with the exception of three or four, were first paretic, *i. e.*, the paralysis was preceded by a paresis. I very much regret the incompleteness of our records respecting the condition of the limbs throughout the entire course of the paralysis, yet some few in different stages I have recently examined, and from these I find the rule to hold good—a certain degree of flaccidity at first with little or no spasms; later the rigidity of the extensors easily excited into an epileptiform condition, the exaggeration of the reflex irritability, changes in the integument, paræsthesia, etc., etc.

In more than one instance I found the reflex power excited by pressure over the inner side of thigh, lower third. Instead of getting the "cremaster reflex" of Jastrowitz,* I produced sudden flexion of the thigh on pelvis and leg on thigh followed within a few moments by the same movements on the opposite side. The sinew reflex of Erb and Westphal, known as the "knee phenomenon," was not found in one or two of the cases wherein the lumbar enlargement was the seat of lesion, thus indicating, at least, that the crural nerve was lacking in its integrity. The centre, however, for reflex motions being in the lumbar cord, disease here must either diminish or completely suppress any of the reflexes.†

The limbs may remain free from muscular spasm indefinitely. Tremors on the least passive motion are often excited, and in one case this was so great at the first examination as to lead to the diagnosis of paralysis agitans. While these peculiar movements resemble the spinal epilepsy of Brown-Sequard,

* *Berlin. klin. Wochenschrift*, No. 81, 1875.

† *JOURNAL OF NERVOUS AND MENTAL DISEASE*, January, 1877, p. 189.

Rosenthal* prefers to designate them as spinal reflex spasms, rather than use a term Brown-Sequard intended for a distinct pathological lesion. Without having dwelt on the symptoms which have been so accurately described by writers from the days of Pott to the present time, I have simply referred to a few not generally specified.

Diagnosis.—It would seem that an observer with ordinary acumen could not err in diagnosing this form of paralysis from other kinds. I mean, of course, to include under "this form" the paralysis due to compression of the cord, be the cause what it may. Tumors of the various types, cancer of the vertebræ, hemorrhages into the canal—all give rise to a group of symptoms which simulate very closely those of paralyzes from Pott's disease; yet by a careful examination, a good history and a knowledge of the physiology of the spinal cord, a differential diagnosis can be made in those cases of unusual obscurity.

An observation I have to make, and in this I do not claim any priority, is that deformity of the inferior extremities from contraction of certain muscles, generally the thigh flexor group, causing the patient to stoop forward resting hands on knees for support, does not constitute a paralysis. More than once I have had this gait described to me as that of paralysis, or paresis. True, there is difficulty in walking, yet no loss of motion—simply a peripheral nerve irritation causing neuralgias and contractions. When the paresis follows by many years the apparent cure of the spinal disease, the paralysis which ultimately ensues may be confounded with other forms. This summer there appeared in the *Lancet* (June 23, 1877), "A Case of a New Form of Pseudo-paraplegia Ending in True Paralysis." This title was followed by "Caries of Dorsal Vertebræ; Death; Autopsy." The report is by Dr. William Alexander and Mr. James Barr. The history of the injury, the increase in the deformity, the pseudo-neuralgias, the periarticular swellings, the paresis at times greater and at times less, the escape at first of the sensory nerves, the later rigidity, the typical extension of the leg and foot in tonic spasm when the

*"Cervical Paraplegia," *JOUR. NERV. AND MENT. DIS.*, Jan., 1877, p. 96.

skin was irritated, the sudden and sharp flexions, the diffusion of the electrical current, later still the paræsthesia, the fulgurating pains, bed sores and death, then the autopsy, at which was found loss of half the bodies of the eleventh and twelfth dorsal vertebræ, a caseous sac, the cord compressed against the posterior part of the spinal canal by inspissated pus above and below by a piece of bone, the ramolissement with destruction of nerve tubes,—all this points so clearly and unmistakably to a paraplegia from the vertebral caries, that I wonder how such a case could have been reported as one of a “*new form of pseudo-paraplegia.*”

THE TREATMENT.

When one has made up his mind fully as to the pathology of an individual case the treatment theoretically resolves itself into

1. The arrest of the mechanical pressure if this be suspected. This object cannot be better accomplished than by the application of a suitable spinal support fitted accurately, and having for its cardinal principle the arrest of all motion at the seat of disease. The apparatus with which all of our cases have been treated is a simple steel frame consisting of two horizontal bars, the one extending from axilla to axilla posteriorly, the other parallel and grasping the ilio-costal spaces just above the iliac crests, while these bars are connected by four vertical ones—two from axilla to crest and one on either side of spinal column about two and a half or three inches apart. This is covered with shaved sheep skin and lined with muslin, of which like material fronts are made to lace along median line anteriorly. The brace is lengthened to suit the locality of the caries, and if the cervical or superior dorsal vertebræ be the seat of disease a steel bar is attached to the body support under consideration, passing from the lower horizontal bar at its centre vertically to the upper one, curving to clear the occiput, and terminating in a small bar to which chin and occipital straps are attached. This supports the weight of the head, relieving the column of the pressure. For a further description with diagram I cannot do better than refer to “*Orthopædia,*” by James Knight, M. D., pp.

323, 324. For twenty years the Doctor has used this apparatus, and I can bear testimony to its utility when not abused. A case or two in point for illustration :

CASE III. *Cervico-dorsal caries with paraplegia almost complete, of six weeks' standing ; recovery in ten days.*

Female, æt. 11, admitted June 20, 1870. The spinal caries was of six months' duration, *i. e.*, the deformity had been observed during that period, though the entire length of time could not be ascertained. Already a marked angular prominence was present. For six weeks she had been unable to walk unless strongly supported, and at date of admission, if properly balanced, she could stand alone for a moment ; on further examination there was found pretty complete motor paralysis of all the muscles of both lower extremities, while sensation was about normal. A body support with the head spring was applied ; within a week and by *July 1*—ten days after her entrance to the hospital—she was *walking alone*. By Oct. 16th she could walk and run with entire freedom. She remained under treatment until the 12th of June, 1871, two months prior to which time the head spring was removed, and was discharged, no sign of relapse occurring.

CASE IV. *Gibbosity from 6th cervical to 3d dorsal ; complete paraplegia, of six months' standing ; walking one month and three days after admission ; recovery of paraplegia complete ; subsequent death from tuberculosis ; no autopsy.*

Female, æt. 6, anæmic and coming from a family with an excellent tuberculous history, admitted to the hospital June 12, 1872. The caries reported to have followed a slight injury one year previously. The treatment was begun about six months later, cupping being the agent. Loss of power was observed three weeks after its employment and soon became complete. Applied to the out-door department of the hospital for relief a month or six weeks prior to admission ; brace and head spring applied, but the mother persisted in leaving it off, and future treatment was made conditional on placing child in hospital. This was done, and the examination on day of entrance discovered total inability to stand or to execute any voluntary movements of the inferior extremities, flaccidity of muscles, and if any excessive reflex irritability, spasm or par-

alysis of sensation existed, this was not recorded in the note book. The head spring was readjusted, a better fit being secured, and constitutional medication was included in the treatment. *July 15th*—one month and three days from the date of admission—the child with a little assistance walked across the floor. *Oct. 12th.* Walking alone and with ease. *May 1st, 1873.* Head support removed, and on *May 29th*, brace removed. *May 30th.* Discharged cured. *Dec. 4th, 1874.* Readmitted after a lapse of eighteen months, having experienced no relapse in that period. Now the mother fancied a returning loss of power, but on examination the limbs were found unaffected, but the patient was suffering from general tuberculosis. Remained a few days, rapidly sinking all the while, and was removed moribund by the mother, who feared a post-mortem. Death occurred between the hospital and the home, and no autopsy was permitted.

Suspension with the view of producing extension and the use of the plaster jacket seem as popular now as were the issues three-quarters of a century ago. I know that immediate cures are currently reported, yet I have searched with some degree of diligence for cases sufficiently well recorded to be of scientific value, and my search has been discouragingly fruitless. Still I can readily imagine spontaneous relief when the angular deformity is the direct cause of the paralysis. Instances of dislocation are abundant wherein reduction was followed by brilliant results. If the pathology lay in a cutting off of the superficial circulation at the point compressed, then I can see how extension would prove serviceable. When, however, a meningeo-myelitis is in active progress, I can see some objection to extending the parts, to rupturing bands of adhesion, to the separation of approximating sections of vertebral bodies. In such cases nature's efforts at repair must be respected, and I know of no better mode of meeting the indication than by accepting the situation and fitting an apparatus simply as a support. The following may serve to elucidate the point:

CASE V. *Sudden paraplegia as result of removal of support; recovery in five months.*

Male, æt. 9, out patient, had apparatus applied, Dec. 15, 1873, for spinal caries, dorsal region with marked angular

deformity; wore this without any symptoms of interest occurring until Jan. 15, 1875. He became tired of apparatus, and the mother without advice removed it; he felt next day a "giving away" sensation in the hump, and almost immediately lost power in the inferior extremities. The angle was found much sharper, and the paralysis was easily explained. The boy was kept in recumbent posture for a few days until a well fitting brace could be applied, after which—a month at least—power began to return, he could stand and with aid walk a few steps.

May 12, 1875.—He walks unassisted, and up to the present time has had no relapse. The case just recorded has this additional point of interest, viz.: the length of time that support is required; it furnishes a powerful text against the practice of removal of apparatus and pronouncing a cure within short spaces of time.

2. The use of remedies either internally or externally known to be effective in controlling the inflammatory process.

If the inflammation be acute, ergot stands foremost in controlling lesions of the cord or its envelopes. This drug has been used in many of the cases treated at the hospital, and in recent ones wherein the inflammation was presumably acute, relief has followed promptly. Yet in those same patients on the occurrence of relapse the same medicine has most signally failed. Remembering, as we should, that the disease is either subacute or chronic in a large proportion of the cases, the inutility of ergot becomes manifest.

Belladonna has been used in several instances with seeming success, yet our experience permits us to say nothing laudatory of this as a curative agent. In the earlier stages, though prior to the paresis, belladonna has proved of undoubted service in the relief of those neuralgias so distressing to the patient.

For chronic myelitis or meningitis, nitrate of silver and the iodide of potassium have seemed to produce the best results.

The actual cautery was used on two patients by Dr. Eugene Dupuy in the out-door department. One little girl, aged 9 years, with dorsal caries five years' standing, and complete paraplegia of fourteen months' standing, was touched with the white hot iron twice a week for a month; and no relief whatever was

experienced. At the present time, six months later, she remains paraplegic with all the usual phenomena.*

Another aged 9 years, cervico-dorsal caries seven years, paraplegia five years, though incomplete a portion of this time, was treated with a single application of three or four points to either side of the spinous processes. No immediate or remote relief has followed. We were unable to get the child to submit to a second operation. I am not unmindful of the merits claimed for this by those two competent observers, Prof. Charcot and Dr. Michaud. In the *British Medical Journal*, Dec. 26th, 1874, I find an abstract of a lecture by the former, and it is reported that a Polish girl, aged 15, was sent from Warsaw to Charcot in order that she might have the cautery used for a paraplegia. She passed through Berlin, and consulted Langenbeck, who sought to dissuade her from the object of her journey. She reached Paris however, underwent two operations at the hands of Charcot, and walked within a fortnight. Soon afterwards she visited Langenbeck on her return homeward, and the great surgeon was convicted of his error. Now this case is very imperfectly recorded, and, of course, may have no scientific value whatever. I have studied the cases in the original memoirs, however, and must confess to a great degree of doubt as to the curative effects of the cautery. Michaud cites a case of "dorsal Pott's, paraplegia with contracture, cure by repeated applications of the hot iron." The patient was first treated by M. Guerin shortly after the invasion of the paraplegia; in three months, worse, entering Hotel Dieu with complete paraplegia; then there was spontaneous recovery which did not long continue. Finally, after sojourning a while at la Pitie she entered la Salpetriere, Jan. 4, 1864,

*This case was complicated by an immense abscess, painless, over right scapula, which was not opened. After her removal from the hospital (Oct. 16th, 1877), she fell into the hands of Dr. W. G. Russell, of Brooklyn, who thought of applying the plaster of paris jacket, but was obliged to postpone it on account of the abscess. This finally opened, and on Feb. 2d I heard, through Dr. Russell, of the return of power in her limbs. On the 14th, she was brought to me completely free from all paralysis. In Dr. R.'s note, he expressed the opinion that had the jacket been applied he would certainly have published the case as a remarkable recovery under that treatment.—V. P. G.

with complete loss of power in inferior extremities. *January* 10, first application. Feb. 20, a second. Beginning of April, a third. "After the first cauterization the pains in the loins, which the patient had experienced, were much less; after the second the contracture diminished a little and the limbs commenced to elongate. Finally, *three months* [italics mine] after the third cauterization the patient began to raise herself by the aid of crutches."* The recovery from this date was gradual but incomplete.

A second instance cited: "disease of dorsal spine, recurring symptoms, applications of the points of iron, cure of the paraplegia." Patient, female, æt. 27, entered Salpetriere in Charcot's service, Jan. 27, '69. Disease, paraplegia eighteen months' standing; first application Feb. 5th, four or five points; March 20th, improvement said to be marked—the paræsthesiæ shown in arms on admission have disappeared, patient can easily sit up; not able to walk. July 17th, two more applications. Middle of August, patient began to walk between the beds, and six weeks later was walking without support. Then typhoid fever supervened. Now this case is reported as cured with the hot iron.

Another, female, æt. 50, entered hospital in service of Charcot, May, 1862; paraplegia with flaccidity, two years standing. May 20th, ordered nitrate of silver, which was not followed by any decided results. On June 8th, 1863, partial recovery having taken place, an application of hot iron was made. Two months later, patient improving all the while, able to walk with ease.

One other instance: "Lumbar Pott's, paraplegia with flaccidity, spinal arthritis, cure by points of iron."

Female, aged 21, entered Salpetriere, June 21, 1871; neuralgia began four years previously, and two years later paresis, paraplegia becoming complete in the month of May, 1869, two years prior to admission to hospital. Even at this time (May, 1869), at another hospital, she was treated with the iron heated to white heat, with very little success. At date of admission to Salpetriere the paraplegia said to be not complete. First cauterization shortly after admission; at the end

* Michaud, loc. cit., p. 71.

of three days was able to walk a little with support; then followed œdema, without albuminuria, interfering with progress of case. Second cauterization Sept. 1st, 1871, and after this (length of time not mentioned) walked a little with aid. Nov. 2, 1871, considered about cured. Such is the testimony I have been enabled to gather from those who speak most sanguinely in favor of the cautery.

3. The protection of the paralyzed members from irritants, and the restoration of function by local applications. I pass purposely the use of warm clothing and such things as the good sense of the mother or the nurse would suggest, to that much vaunted remedy for all forms of paralysis—*electricity*. Galvanism and Faradism are advised by nearly all writers on this subject, especially during convalescence. These currents have become so popular as diagnostic aids, that the notes of no case are considered complete without a record of the action of the muscles and nerves to the current. For this reason some of our patients have been subjected to this test, and others while convalescing have been electrized simply to expedite the cure. That much ill may follow the use of this powerful agent, I have come to believe, after several years of what I may justly call experience. I have often, in mentally reviewing cases thus treated, come to the conclusion that I have done harm; still I propose not, in this connection, to do aught but state facts.

CASE VI. *Dorsal caries with gibbosity; paraplegia complete; partial recovery in two months; treatment during convalescence by Faradism; relapse and death.*

Female, æt. 9, strumous disease of upper dorsal vertebræ, three years' standing; admitted July 18, 1870. There was found complete loss of power in both inferior extremities, with easily excited spasm of flexors of the leg. There was total inability to stand, or to execute any voluntary movements in any of the muscles with the exception of the flexors of the great toe. Sensation was perfect and reflex irritability exaggerated. A spinal brace with head-spring attached was soon applied—within a week—and on June 31st, thirteen days after admission, the child could stand by a chair. Sept. 3d. Since the last observation, the patient has experienced an exhausting diarrhœa, and the note to-day is: "child seems well,

but condition of limbs about same as on entry." *Sept. 11th.* "Begins to walk a little with the aid of a chair." *Oct. 18th.* The improvement has continued and voluntary movements of the feet can now be executed with ease. *Dec. 13th.* "Pretty good movements throughout entire lower extremities." 1871, *Jan. 30th.* Within past fortnight an exanthem, very like to that of measles, has appeared, and it is recorded that the child is quite feeble, though all spasmodic or excessive reflex actions have disappeared. *Feb. 10th.* Tendones Achillis slow in yielding and apparatus for feet ordered. *April 12th.* Stands alone and walks freely with a chair. By the latter part of August permanent improvement seemed to have taken place, and to complete the cure Faradism to the muscles was begun and continued tri-weekly for a month or six weeks. From this time it is reported on *Nov. 23,* that the "girl's walk became gradually worse and worse, and about *Nov. 1st* a small slough appeared upon the right hip. This seemed to be the result of constant sitting and defective innervation. The patient is confined to the bed, * * * is cheerful, has a good appetite, and the sensation of the lower extremities is pretty well retained." *Dec. 28th.* "Removed by the parents. For several days an aggravating ulcerative stomatitis. There is also a gangrenous slough over each nates; unable to walk, or even stand with assistance." It was reported at the hospital that the patient died at home a short time subsequent to removal. No autopsy.

In the case of "new form of pseudo-paraplegia," reported in the *Lancet*, and to which I have already referred in the illustration of another branch of my subject, the electrical treatment was employed, both currents, and it is significant to note the patient's steady decline after its first employment.

Rosenthal reports a case, which is quoted by Michaud: female, presenting a gibbosity of dorsal vertebræ sixth to the ninth; the motor paralysis was not complete, the patient could take a few steps, but with great difficulty. *The electrical contractility was normal, as to muscular and cutaneous electro-sensibility it was wanting.* It is related, that three months later the paraplegia was complete and the patient succumbed.*

* Michaud, loc. cit., p. 48.

The particulars are not given, and the electrical examination, presumably thorough in the hands of so zealous a scientist as Rosenthal, may have had nothing to do with the result. The case whose notes I shall now record was examined electrically.

CASE VII. *Dorsal caries, marked angular prominence; paraplegia three years, then signs of recovery; electrical examination followed by relapse; interstitial nephritis and death; no autopsy.*

Male, æt. 3½, admitted April 24, 1873, in a paraplegic condition of some eight months' standing, while the signs of Pott's disease were of about sixteen months' standing. Very little recorded of his family history. It was noted on admission that he had no power to stand even when assisted; that the limbs were not atrophied, and that they were quite rigidly extended on the slightest provocation. Apparatus was applied, including support for the head, and it was not until January, 1875, that any signs of improvement could be observed. At that time he began to stand with a little assistance and even to take a step or two. The clothing, however, emitted a strong urinous odor, signifying paresis of the vesical sphincter. Faithful efforts to induce him to stand and walk were attended with only partial success, and by *Jun.* 19, 1876, there was little change worthy of record. The spasmodic actions were still prominent and tremors were easily induced. The right lower extremity was certainly more under the control of the will than at date of last observation.

Nov. 19th. Condition much about the same; he takes a few steps every day by holding to a chair which is drawn slowly along. To-day, an electrical examination is made. To galvanism, no response through the muscles, but response good through the nerves. Faradic contractility in muscles normal. There is no flaccidity, but rigidity of adductors of thigh and extensors of foot. The odor of urine from clothing very strong.

Dec. 1. Nurse reports a slight febrile movement every evening, and temperature this P. M. 101°.

Dec. 8. The boy has not attempted to stand or to walk since the electrical examination. The paralysis seems complete.

March 7, 1877. No signs of improvement since last observation; slight œdema of feet, urine incontinent. *March 14.*

Œdema of feet continues, skin glossy; urine straw colored, of a specific gravity 1,008, albuminous fifty per cent., renal epithelium and phosphates in abundance, but no casts found. Since he has had no congestion abscess it is fair to presume that the nephritis depends either directly on a cord lesion, or on a cystitis, the inflammation extending through the ureter.

July 1. For past week or ten days has been failing rapidly, and this afternoon died, apparently of œdema of the lungs. No autopsy.

CASE VIII. Dorsal caries with incomplete paraplegia; improvement interrupted by electrical examination.

Female, æt. 7 years—admitted Sept. 5, 1876, with an unreliable history. The weakness in inferior extremities was reported to have existed about eleven months. An examination was made on the day of admission and results: Unable to stand without assistance, though when well supported stands and takes a few steps shuffling one foot around the other; spinous process of vertebræ included between last cervical and eighth dorsal project in a sharp curve, the summit of which is an inch from the vertical bearing; no tenderness on pressure or percussion at any point; in dorsal decubitus can flex the right thigh to an angle of about 150°, while the left is flexed to over a larger arc, though neither can be held in this position any length of time; with legs flexed can flex both thighs to a right angle; power to extend thighs about normal, while that to extend legs about half what the normal should be; the "foot phenomenon" well marked on right side, less marked on left; *i.e.*, tremor is induced by passive dorso-flexion of the foot.

December 1. Shortly after admission apparatus was applied, and by the middle of October the child was standing and walking with the aid of a chair. Two weeks ago the case was examined electrically; faradic contractility was found normal, while the galvanic was diminished. During the past week the patient has grown decidedly worse; she is now unable to stand or walk at all. She became very helpless, had incontinence of urine and fœces, and various remedies were used with tardy results; this condition, in fact, continued until the summer of present year, when she began to regain very slowly

the power lost, and by *December 3, 1877*, she has so far recovered that walking by the aid of a chair is comparatively easy. The child has walked recently a short distance alone. A perfect cure is confidently expected.*

I am prepared to admit an abuse of the current, for instance, the employment of the ascending galvanic current when the descending should be employed, the faradic when the galvanic alone is indicated, and *vice versa*; I am not sure that I used the currents with that discrimination in the earlier cases as I have in the later ones; still, granting all this, I am unwilling, as yet, to admit in the present unsettled state of our knowledge of the various phenomena of electricity, that a descending current will always descend through just the nerves and muscles we desire, and will never ascend unless we so place our poles with that object in view; I am not prepared to admit the possibility of localizing a current to a nerve or a muscle in a member in which the reflex irritability is as great as it is in members paralyzed from Pott's disease. If straining at stool, a tickling of the foot, the mere contact of the finger to parts of the limb, a puff of wind even, will call into play the most violent tonic spasm through the ready conveyance of such impressions through sensory nerves to those reflex centres, I fail to see how so powerful an agent, even in its milder forms, can be used with impunity. Too much stimulation of the nerve centres can induce congestion, and a congestion long continued must inevitably result in a myelitis.

Dr. F. D. Lincoln, in a recent number of the *Boston Medical and Surgical Journal*,† after reporting several cases in which injury followed the use of electrical treatment, makes the following pertinent remarks:

"Another effect of too concentrated galvanic currents is the production of superficial eschars rather slow in healing. It is well to say to those who have had little experience that these may be produced in a few minutes without any warning pain, in certain patients whose cutaneous perceptions are weakened.

* * * * * Benedikt, who treats this subject

* This case has recovered since the reading of this paper.

† October 25, 1877, p. 469, et seq.

with a remarkably free hand, uses the following words: "The electric current is *contraindicated* in cases, where in spite of all precautions, it is not borne well: for instance, in a few cases of tabes and hysteria, where it provokes violent symptoms of irritation; in cerebral affections when symptoms of congestion appear. * * * *

An increase of the bad symptoms ought on no account to occur during the electrical treatment. If it does occur, the intensity,* etc., must be modified. * * * *

A general rule respecting the intensity of the current is, that *painful currents are not only unnecessary but, as a rule, harmful.* * * * *

General convulsions, spasmodic tension of the muscles, giddiness, pain, paralysis, cerebral hemorrhage, etc., etc., are frequent consequences of too painful currents."

I could adduce cases from the current medical literature and add still further proof in support of the position I have taken, but time and space forbid. Now, if all the instances I have brought forward be mere coincidences, and if the agent were used at an unfortunate period, I can still claim that a certain jeopardy is incurred, and I claim that it is not only useless but unscientific to employ the current in cases where convalescence seems well established. Such practice I say is not only attended with a certain degree of danger, but brings a valuable remedy into undeserved disrepute.

PROGNOSIS.

Of the fifty-eight cases thirteen have died, six dying from myelitis, five from other diseases subsequent to the establishment of a cure, and two from tuberculosis before the complete restoration of power to the limbs. The mortality, then, is about 10½ per cent. Twenty-nine recovered from the paraplegia; eight of these relapsed and all recovered again save one, who is still under treatment, along with the remaining fourteen still unrelieved.

The idea seems quite prevalent that paralyzes from Pott's disease are incurable. I could report several cases had I time

* *Electrotherapie*, 1874, p. 182.

to show how hopeful even the most hopelessly appearing were. Some have been paralyzed four, five and ten years, and then have made a recovery; some have had grave eye lesions—pupillary disturbance, optic nerve atrophy, and have made a fair recovery, one had marked cystitis and a single irrigation afforded permanent relief—I have notes before me now of grave myelitis wherein perfect recovery is recorded.

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ART. V.—A CONTRIBUTION TO THE PATHOLOGICAL ANATOMY OF DISSEMINATED CEREBRO-SPINAL SCLEROSIS.

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(*A paper before New York Neurological Society, Feb., 1878.*)

MR. PRESIDENT AND GENTLEMEN: This thesis is based upon two cases. Case I. came under the observation of Dr. Van Derveer, of Albany; the history is as follows:

Thos. Grogan, accountant, æt. 29, unmarried. Mother died at the age of 49, during her climacteric period, from the exhaustion following sciatica. One brother died of phthisis pulmonalis at the age of 26. Several brothers and sisters died during infancy. The father, a brother and a sister are still living, and in good health. Saw the case first in Feb., 1870, when the following facts were elicited:

Habits have always been good; no sexual excess or masturbation, and has not been exposed to venereal diseases. Has been quite studious and had acquired a good education. Was fond of society, and spent many of his evenings at dances up to the time he was taken sick.